

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF)
VIJAYALAKSHMI et al.)
SERIAL NO.: 10/550,752) Examiner: Nikki H. Dees
FILED: SEPTEMBER 05, 2007) Art Unit: 1781
FOR: PROCESS FOR THE PREPARATION) Atty. Docket No. KNS1.001APC
OF CUSTARD APPLE JAM AND THE
CUSTARD APPLE JAM THUS OBTAINED)
)

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner of Patents
P.O. Box 1540
Alexandria, VA 22313-1450

Sir:

In response to the Office Actions dated April 04, 2011, the undersigned declares as follows:

1. I, S. Rajarathnam, a citizen of India, hereby declare that I am one of the inventors of the application entitled "A PROCESS FOR THE PREPARATION OF CUSTARD APPLE JAM AND THE CUSTARD APPLE JAM THUS OBTAINED". I am residing at the below-referenced address. I am working as "Chief Scientist" at Central Food Technological Research Institute, Mysore which is a premier Research Institution under the Council of Scientific & Industrial Research. I have 37 years of experience in Research and Development of Fruits and Vegetables. I have published several research papers in international journals and am an inventor of 24 patents and applications for patents on various aspects of Preservation and processing of Fruits Vegetables including mushrooms. My detailed Curriculum Vitae is attached herewith.

2. I have reviewed all the office actions issued from USPTO regarding this application and the documents McGee (McGee, H. 1984. On Food and Cooking. pp. 170-172), Section 5.3 entitled "Chemical Preservation" of Dauthy (Dauthy, M.E. 1995. "Fruit and Vegetable Processing." FAO Agricultural service Bulletin 119,) and Rao (Rao, S.N. 1974 "Anonas the legendary fruit" Indian Horticulture, Agric. Coll. Bapatia, Ap. India. Vol. 19. pp. 19-21) as cited by the Examiner. In the office action dated April 04th, 2011, the Examiner has asked to

provide some data which shows that unexpected results have been obtained by performing the specific steps of the present invention as compared to the prior art. Therefore, I have carried out experiments showing that the process of present invention provides unexpectedly better custard apple jam in comparison to process of prior art.

3. The custard apple jam prepared by the two processes is given below. The processes are as follows:

Jam 1 was prepared in accordance with process of the present invention and included the following sequence of steps:- (a) add 1st stage sweetening agent; (b) perform 1st stage heating (c) add 2nd stage sweetening agent; and (d) perform 2nd stage heating. More particularly, the process comprised:-

- a) mixing a sweetening agent (300g of sugar) with custard apple pulp (450g);
- b) then, partially dehydrating the mixture below the temperature of 55 °C under vacuum (0.2-0.8kg/cm²);
- c) adding a syrup comprising sweetening agent (268 g), pectin (8g) and citric acid (4.3g) to the partially dehydrated mixture; and
- d) boiling the mixture at a temperature of 95°C and cooling to obtain the jam.

Jam 2 was prepared in accordance with the teaching of McGee and Rao which included the following steps:-

mixing a sweetening agent (568g of sugar) with custard apple pulp (450g);

- a) adding citric acid (4.3g); and
- b) boiling the mixture at a temperature of 95°C and cooling to obtain the jam.

4. It can be observed that the distinction between the two processes lies in number of stages in which sugar was added and number of stages in which heating was performed. The specific four stages outlined by steps (a)-(d) not only include the addition of sweetening agent in two stages, they also include two phases of heating. On the other hand, the process cited in prior art only includes addition of sweetening agent in one stage and one stage heating.

5. The following observations were made with regard to the jams prepared by the above two processes:

Parameters	Jam 1	Jam 2
Bitterness	Absent	Present
Off flavor	Absent	Present
Taste	Very excellent	Not acceptable

6. The data clearly shows Jam 1 (prepared in accordance with the teachings of the present invention) is far superior than Jam 2 (prepared in accordance with the combined teachings of McGee and Rao) in terms of its organoleptic properties, shelf life, free of bitterness and off flavor. We attribute the improvement in the properties of the Jam (which are un-expected) to the process of making the Jam. More particularly, we attribute the unexpected improved properties to (a) adding the sweetening agent in two-stages; (b) performing the heating in two-stages; and (c) interlacing the two-stages of adding sweetening agent and the two-stages of heating.

7. We would also like to bring to your knowledge that the pulp removed from mature, ripe custard apple fruits in bulk under pilot scale, when heated during processing to a temperature above 55°C turned intensively bitter, off flavoured and discolored. Hence here is a process which depicts preparation of bitter free jam with introduction of an additional step of partial dehydration of the pulp at a temperature not exceeding 55 °C. Thus, the process emphatically emphasizes the importance of partial dehydration of the pulp at 55°C without which a final product free of bitterness, off flavor and discoloration is not possible to be achieved.

8. The undersigned hereby declares that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the application of any patent issued thereon.

Respectfully submitted,

Date: 1st July 2011

S. Rajarathnam

(S.RAJARATHNAM)

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CURRICULUM VITAE

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Date of Birth: 4 March 1953

Sex: Male

Educational Qualifications:

University	Degree	Year	Division / Class / Grade
University of Mysore	B.Sc.	1971	First Class*
"	M.Sc. (Botany)	1973	First Class**
"	Ph.D.(Applied Botany)	1982	

* Represented "University First" from the faculties of Biological Sciences, from the University of Mysore.

** a. was awarded subject scholarship in M.Sc. (Previous)
b. Secured Fifth Rank in M.Sc. (Final)

Guide ship recognized: Biotechnology (University of Mysore) [Current No. of students: 2]

Ph.D Thesis: “Studies on pathological and biochemical aspects during cultivation and storage of the white oyster mushroom,*Pleurotus flabellatus*”(Guide:Dr.M.V.Patwardhan)

Research Experience: 36 Years

Patents: 24

Technologies Developed: 24

Publications:

- | | |
|---|------|
| a) Research Papers | - 41 |
| b) Reviews Presented at Symposia | - 22 |
| c) International Reviews/Chapter for Text Books | - 19 |
| d) Popular Article | -1 |

Fields of Research Experience:

1. Post-harvest technology for extension of storage life of fresh fruits and vegetables.
2. Processing and development of value added products from fruits, vegetables and mushrooms.
3. Chemistry and Bio-Chemistry of mushrooms, fruits and vegetables.
4. Large scale mushroom production and processing.
5. Nutraceuticals from fruits, vegetables and mushrooms.

Awards:

1. Received the “National Technology Award” by the Ministry of Science and Technology, New Delhi, on 11th May 2003 for contribution to the development and transfer of technology on “Large scale production of organic quality mushrooms and processed products for domestic and export trade”.
2. Awarded the First Prize for poster presentation on “Avenues for processing of custard apple”, in the IFCON 2003 held during 5-8th Dec. 2003 at CFTRI, Mysore.

Recognitions:

- 1) Based on the database inquiries, **selected as a “Referee” to the American Chemical Society (USA) and British Mycological Society (UK).**
- 2) **Selected at the world level** for contributions of two articles on “**Mushrooms**” in **Encyclopedia of Food Science and Nutrition, Academic Press, U.S.A.** published once in ten years (10 Volumes costing Rs 1,00,000/-).

Others:

- 1) Serving as Referee to Department of Biotechnology and Department of Science and Technology, DSIR and CSIR, New Delhi for evaluating the project proposals, for financial support.
- 2) Serving as a member of Bureau of Indian Standards, New Delhi.
- 3) Serving as editor to the Journal of Food Science and Technology (India)
- 4) Worked as Principal investigator and Co-principal investigator of Department of Biotechnology (New Delhi) sponsored projects on Mushroom Science and Technology since 1993.
- 5) As Principal Investigator of several other projects on fruits and vegetables

List of Publications

I. Research Papers

1. **Rajarathnam,S., Zakia Bano and M.Muthu (1977) Studies on the control of *Sclerotium rolfsii* Sacc. contamination during the cultivation of *Pleurotus flabellatus* (Berk and Br.) Sacc., efficacy of methyl bromide. *The Mushroom Journal, (U.K)*, No. 57, 294-298.**
2. **Rajarathnam,S., N.S.Singh and Zakia Bano (1979) Efficacy of carboxin and heat treatment for controlling the growth of *Sclerotium rolfsii* during culture of the mushroom *Pleurotus flabellatus*. *Annals of Applied Biology (U.K)*, 92, 323-328.**
3. **Rajarathnam,S., D.B.Wankhede and M.V.Patwardhan (1979) Some chemical and biochemical changes in straw constituents during the growth of *Pleurotus flabellatus* (Berk & Br.) Sacc. *European Journal of Applied Microbiology and Biotechnology (West Germany)*, 8, 125-134.**
4. **Rajarathnam,S., Zakia Bano and M.V.Patwardhan (1983) Post-harvest physiology and storage of the white Oyster mushroom, *Pleurotus flabellatus*. *Journal of Food Technology (U.K)*, 18, 153-162.**

5. **Rajarathnam,S.,** Zakia Bano and N.S.Singh (1983) Efficacy of formaldehyde and liquor ammonia for controlling the growth of *Sclerotium rolfsii* during cultivation of the mushroom *Pleurotus flabellatus*. **Mushroom Newsletter for the Tropics (Hong Kong)**, 3(4), 3-10.
6. **Rajarathnam,S.,** Zakia Bano and P.Narasimham (1984) *In vitro* evaluation of some fungicides to control *Sclerotium rolfsii* contamination during cultivation of the mushroom, *Pleurotus flabellatus* (Berk & Br.) Sacc. **Mushroom Newsletter for the Tropics (Hong Kong)**, 5(2), 7-11.
7. Singh,N.S. and **Rajarathnam. S** (1977) *Pleurotus eous* (Berk) Sacc. A new cultivated mushroom. **Current Science (India)**, 46, 617-618.
8. Zakia Bano, **Rajarathnam. S** and N.Nagaraja (1978). Some aspects on the cultivation of *Pleurotus flabellatus* in India. **Mushroom Science (France)**, X (2), 597-608.
9. Zakia Bano, N.Nagaraja, **Rajarathnam. S** and M.V.Patwardhan (1979) Cultivation of *Pleurotus* species in a village model hut. **Indian Food Packer XXXIII (6)**, 19-25.
10. Zakia Bano, **Rajarathnam. S** and M.Muthu (1981) Use of ethyl formate in controlling the growth of *Sclerotium rolfsii* during cultivation of *Pleurotus* species. **Mushroom Science (Australia)**, XI(2), 541-549.
11. Chandrashekhar,T.R., Zakia Bano and **Rajarathnam. S** (1981) Incompatibility and growth in *Pleurotus flabellatus*. **Transactions of the British Mycological Society (U.K)**, 77, 491-495.
12. Zakia Bano and **Rajarathnam. S** (1982) Studies on the cultivation of *Pleurotus sajor-caju*. **The Mushroom Journal (U.K)**, 115, 243-245.
13. Zakia Bano, **Rajarathnam. S** and K.Narasimha Murthy (1986) Studies on the fitness of "Spent straw" obtained during cultivation of the mushroom *Pleurotus sajor-caju* for safe consumption as cattle feed. **Mushroom Newsletter for the Tropics (Hong Kong)**, 6(3), 11-16.
14. Zakia Bano and **Rajarathnam.S** (1986) Vitamin values of *Pleurotus* mushrooms. **Qualitas Plantarum : Plant Foods for Human Nutrition (Netherlands)**, 36, 11-15.
15. **Rajarathnam,S.,** Zakia Bano and M.V.Patwardhan (1985) Nutrition of the mushroom *Pleurotus flabellatus* during its growth on paddy straw substrate. **The Journal of Horticultural Science (U.K)**, 61, 223-232.
16. **Rajarathnam,S.,** D.B.Wankhede and Zakia Bano (1987) Biotechnological implications of degradation of rice straw degraded by *Pleurotus flabellatus* **Journal of Chemical Technology and Biotechnology (U.K)**, 37, 203-214.
17. **Rajarathnam,S.,** Zakia Bano, R.G.Berger and F.Drawert (1990) Effect of amendment of the growth substrate on the flavour composition of fruit bodies of *Pleurotus flabellatus* **Chemie Microbiologie Technologie er Lebensmittel (West Germany)**, 12, 145-150.
18. **Rajarathnam, S.,** M.N. Shashirekha and Zakia Bano (1992) Inhibition of growth of *Pleurotus flabellatus* (Berk. & Br.) Sacc. on rice straw by *Sclerotium rolfsii*. **Scientia Horticulturae (Netherlands)**, 51, 295-302.

19. Zakia Bano, M.N.Shashirekha and **Rajarathnam, S** (1993) Improvement of the bioconversion and biotransformation efficiencies of the oyster mushroom (*Pleurotus sajor-caju*) by supplementation of its rice straw substrate with oilseed cakes. **Enzyme Microbial Technology** (U.K), **15**, 985-989.
20. **Rajarathnam,S.**, Shashirekha,M.N., and Zakia Bano (2001) Biodegradation of gossypol by the white oyster mushroom, *Pleurotus florida*, during culturing on rice straw growth substrate, supplemented with cottonseed powder. **World Journal of Microbiology and Biotechnology** (Netherlands), **17: 221 - 227.**
21. Shashirekha,M.N., **Rajarathnam,S.**, and Zakia Bano (2001) Chemical and biochemical changes in the rice straw substrate related to the morphogenesis, cropping pattern and yield of *Pleurotus florida* (Block & Tsao). **Journal of Horticultural Science and Biotechnology** (U.K), **76(3) : 332 - 337.**
22. Shashirekha,M.N., **Rajarathnam,S.**, and Zakia Bano (2001) Enhancement of bioconversion efficiency and chemistry of the mushroom, *Pleurotus sajor-caju* (Berk & Br.) Sacc. produced on spent rice straw substrate, supplemented with the oil seed cakes. **Food Chemistry** (U.K) **76:** 27– 31.
23. **Rajarathnam,S.**, Shashirekha,M.N. and Rashmi [2003] Biochemical changes associated with mushroom browning in *Agaricus bisporus* and *Pleurotus florida* : Commercial implications. **Journal of the Science of Food and Agriculture** [U.K.], **83:** 1531-1537.
24. **Rajarathnam,S.**, Shashirekha,M.N. and Zakia Bano (2005) Influence of supplementing the rice straw growth substrate with cotton seeds, on the analytical characteristics of the mushroom, *Pleurotus florida*. **Food Chemistry** [U.K.], **92:** 255-259
25. Nethravathi,G.P.,Sathisha,U.V.,Shylaja,M.Dharmesh,Shashirekha,M.N.,and **Rajarathnam,S.** (2006) Anti-oxidant Activity of Indigenous Edible Mushrooms. **Journal of Agricultural and Food Chemistry**, **54:** 9764-9772.
26. Shashirekha M.N., Revathy Baskaran, Jaganmohan Rao, L., Vijayalakshmi M.R. and **Rajarathnam S.** Influence of processing conditions on flavor compounds of custard apple (*Annona squamosa,L*).**LWT-Food Science and Technology** (UK),
27. Shashirekha M.N., **Rajarathnam S.**(2007) Bioconversion and biotransformation of coir pith for economic production of *Pleurotus florida*: chemical and biochemical changes in coir pith during the mushroom growth and fructification. **World Journal of Microbiology and Biotechnology**, **23:** 1107-1114.
- 28.Kavishree, S., Hemavathy, J., Lokesh, B.R., Shashirekha, M.N., and **Rajarathnam, S.**,(2007) Fat and Fatty acids of Indian edible mushrooms. **Food Chemistry**.

II. Research Papers (In Process)

29. **Rajarathnam,S.**, Zakia Bano and Shashirekha,M.N. Observations on the growth and *in vitro* degradation of rice straw by fungal contaminations found in beds of the mushroom *Pleurotus flabellatus* ; ecological considerations. **Annals of Applied Biology (U.K.)**.
30. Shashirekha,M.N., **Rajarathnam,S.**, Rashmi and Meera,M.S. Oxygen and carbon-di-oxide changes in the package atmosphere of *Pleurotus florida* under different storage conditions. **International Journal of Food Science and Technology [U.K.]**.
31. Shashirekha,M.N., **Rajarathnam,S.**, Meera,M.S. and Rashmi Influence of factors on changes in reflectance of *Agaricus bisporus* and *Pleurotus florida* during storage. **Journal of Food Science [U.S.A.]**.
32. Meera,M.S., Shashirekha,M.N., **Rajarathnam,S.**, and Varadaraj,M.C. Microbiological quality of *Agaricus bisporus* and *Pleurotus florida* under different conditions of storage. **Food Microbiology [U.K.]**.
33. **Rajarathnam,S.**, Shashirekha,M.N. and Zakia Bano CP-MAS C¹³ NMR of rice straw and its isolated fractions (celulose, hemicellulose and lignin) during biodegradation by *Pleurotus florida*. **Journal of Chemical Technology and Biotechnology (U.K.)**
34. Shashirekha,M.N., **Rajarathnam,S.** and Zakia Bano Effect of supplementing rice straw substrate with cotton seed fractions on the formation of fruiting primordia, yield and protein content of *Pleurotus florida*. **World Journal of Microbiology and Biotechnology (U.K.)**.
35. Shashirekha,M.N., **Rajarathnam,S.** and Zakia Bano Pre-treatment of coffee pulp for economic bio-conversion by *Pleurotus florida*. **Enzyme Microbial Technology (U.K.)**.
36. Mallikarjuna SE, Mahadevamma M, Shashirekha MN and **Rajarathnam S.** Carbohydrate composition of the mushrooms, Lentinula edodes. **Food Chemistry**.
37. Sowbhagya, Shashirekha MN and **Rajarathnam S.** Pigments from mangosteen rind. **Journal of Science, Food and Agriculture**.
38. Mallikarjuna SE, Murlikrishna, G, Shashirekha MN and **Rajarathnam S.** Physicochemical characteristics of water soluble polysaccharides from Lentinula edodes. **Carbohydrate Research**.
39. Shivleela,V.B., Shashirekha,M.N., Jagan Mohan Rao, L and **Rajarathnam, S.** Physicochemical properties of xanthones isolated from Mangosteen rind. **Journal of Science, Food and Agriculture**.
40. Shivleela,V.B., Shashirekha,M.N., Shylaja Dharmesh, **Rajarathnam, S.** Biochemical properties of Mangosteen rind and beverage therefrom. **Food Chemistry**.

41. Shivleela,V.B., Shashirekha,M.N., Shylaja Dharmesh, **Rajarathnam, S.** Biochemical changes and biofunctional properties of sweet orange (*Citrus sinensis*) juice during debittering. **Journal of Science, Food and Agriculture.**

III. Research Reviews Presented at the Symposia

42. **Rajarathnam,S.** and Zakia Bano (1987).Biological significance of the natural lignocellulosic wastes degraded by *Pleurotus mushrooms*. **Indian Mushroom Science (India)** II, 296-304.
43. Zakia Bano, **Rajarathnam,S.** and Nagaraja, N. (1987). Some important studies on *Pleurotus* mushroom technology. **Indian Mushroom Science (India)**, II, 53-64.
44. **Rajarathnam,S.** and Zakia Bano (1987). Culturing and processing of oyster mushrooms ^a.
45. Zakia Bano and **Rajarathnam,S.** (1987). Prospects of *Pleurotus* technology in India ^a.
46. Zakia Bano, **Rajarathnam,S.** (1989). Bioconversion of straw by oyster mushroom. **Fibrous Crop Residues as Animal Feed**, ICAR (India), 57-65.
47. Zakia Bano, and **Rajarathnam,S.** (1994). Mushroom Production. In: Specialist Group Meeting and Symposium on Solid State Fermentation", 23-24 March 1994, **Trivandrum**. Seminar on Mushroom Cultivation organized by Agricultural Finance Department, Central Office, Indian Bank, Madras (India), July 1987.
48. Zakia Bano and **Rajarathnam, S.** (1994) Mushroom Processing Future Perspective. In: "**National Symposium on Mushrooms**",8-10 April 1994, Solan (Himachal Pradesh).
49. **Rajarathnam,S.**, Shashirekha, M.N., and Zakia Bano (1997) Renewable ligninocellulosic wastes – the growth substrates for mushroom production: national strategies. pp. 291 – 304. **Advances in Mushroom Biology and Production**. Mushroom society of India. NCMRT, Solan.
50. Zakia Bano, **Rajarathnam, S.** and Shashirekha, M.N. (1997) Post-harvest physiology, quality and storage of fresh mushrooms. 7pp 321 – 338. **Advances in Mushroom Biology and Production**. Mushroom society of India. NCMRT, Solan.
51. Zakia Bano, and **Rajarathnam, S.** (1994) Mushrooms - Human Nutrition and Health. In : **Microbes for better living**. MICON - 94, 35th AMI Cong., 9-12, November 1994. 395-399.
52. **Rajarathnam,S.**, Zakia Bano and Shashirekha,M.N. (2000) Mushrooms : An item of food delicacy or Health conditioner. In: **Microbial Biotechnology for Sustainable Development and Productivity** (Ed., R.C. Rajak) pp : 140 - 151, Scientific Publishers, Jodhpur.
53. Vijayalakshmi M.R., Revathy Baskaran, Iboiyama singh, N., Shashirekha M.N., **Rajarathnam s.** (2003) Avenues for processing custard apple. 5th International Food Convention, 5-8 December 2003, India (Poster presentation).
54. Manoj Kumar Verma, Vijayalakshmi, M.R., and **Rajarathnam, S.** (2003) Colour stability in grape (Bangalore grape variety) products during processing and storage. 5th International Food Convention, 5-8 December 2003, India (Poster presentation).
55. Kavishree,S., Hemavathy,J., Lokesh, B.R.,Shashirekha, M.N., and **Rajarathnam,S.**,(2004) Studies on lipids of indigenous edible mushrooms.ICFOST-2005.(Poster presentation).

56. **Rajarathnam,S.** (2004) Naturally growing mushrooms of the tribal belts of India :A diverse range of species for diversified applications.(Invited Lecture, at ICFOST-2004).
57. Nethravathi, G.P., Sathisha, U.V., Shylaja, M. Dharmesh, Shashirekha,M.N. and **Rajarathnam, S.** Antioxidant activity of indigenous edible mushrooms. Poster presentation at ICFOST 2005 (December 2005, at CFTRI, Mysore).
58. Shashirekha, M.N., Nethravathi, G.P., and **Rajarathnam, S.**Nutritional and nutraceutical evaluation of indigenous edible mushrooms. Poster presentation at the International Conference on "Biotechnology Approaches for Alleviating Malnutrition and Human health". 9-11th January 2006, at UAS, Bangalore.
59. Thejaswini, H.B.; Tharanathan, R.N., Mahadevamma, S., Shashirekha, M.N., and **Rajarathnam, S.,** Polysaccharides from Calocybe indica: Physico-chemical characteristics For Poster presentation at 75th Annual SBC Conference, New Delhi, 8-11th December 2006.
60. Srunga Narayana., Srinivas, P., Shashirekha, M.N., and **Rajarathnam, S.,**Phenolics of the mushroom, C tropicalis. For Poster presentation Annual SBC Conferencee, New Delhi, 8-11th December 2006.
61. M.N.Shashirekha, M.R.Vijayalakshmi, Revathy Baskaran and **S.Rajarathnam.** "Processing of low cost pear fruit into value added products, free of discoloration and merited nutri / nutra values". IFCON-2008, Dec 15-19, 2008, Mysore.
62. Mallikarjuna SE, Mahadevamma M, Sukumar Debnath, Lokesh BR,Shashirekha MN and **Rajarathnam S** (2009). Carbohydrate and lipid composition of the mushrooms Lentinula edodes and L. cladopus. 20th Indian Convention of Food Scientists & Technologists(ICFOST-2009), 21-23, Dec. 2009, held at NIMANS, Bangalore, India,p-166.
63. Ranjini A, Devendra J Haware, Mallikarjuna SE, Vijayalakshmi MR,Shashirekha MN and **Rajarathnam S** (2009). Mineral composition of species of Lentinula (Shiitake) compared to species of Pleurotus(Oyster) mushrooms. 20th Indian Convention of Food Scientists& Technologists(ICFOST-2009), 21-23, Dec. 2009, held at NIMANS, Bangalore, India,p-167.

IV. International Reviews/Chapter for Text Book

64. Zakia Bano and **Rajarathnam. S.** (1982) *Pleurotus* mushrooms as a Nutritious Food. In: **Tropical Mushrooms, Biological Nature and Cultivation Methods**, (Hong Kong), Edited by S.T.Chang and T.H.Quimio, Chinese University Press.
65. **Rajarathnam,S.** and Zakia Bano (1988) *Pleurotus* mushrooms. Part IA. Morphology, Life Cycle, Taxonomy, Breeding and Cultivation. **CRC Critical Reviews in Food Science and Nutrition (U.S.A)**, 26(2), 157-223.
66. **Rajarathnam,S.** and Zakia Bano.(1988) *Pleurotus* mushrooms. Part IB. Pathology, *in vitro* and *in vivo* growth requirements, and world status. **CRC Critical Reviews in Food Science and Nutrition (U.S.A)**, 26(3), 243-311.
67. Zakia Bano and **Rajarathnam,S.** (1988) *Pleurotus* mushrooms. Part II. Chemical composition, nutritional value, post-harvest physiology, preservation and role as human food. **CRC Critical Reviews in Food Science and Nutrition (U.S.A)**, 27(2), 87-158.

68. **Rajarathnam,S.** and Zakia Bano.(1989) *Pleurotus* mushrooms. Part III. Biotransformation of natural lignocellulosic wastes: Commercial applications and implications. **CRC Critical Reviews in Food Science and Nutrition (U.S.A)**, **28 (1)**, 31-113.
69. **Rajarathnam,S.**and Zakia Bano.(1990) Biological utilization of the fruiting fungi. In: **Advances in Applied Mycology**, **Marcel Dekker Press**. Inc., New York (U.S.A), **3**, 241-392.
70. **Rajarathnam,S.** Shashirekha,M.N. and Zakia Bano.(1992) Biopotentialities of the Basidiomacromycetes, In: **Advances in Applied Microbiology**, Academic Press Inc., California (U.S.A), **37**, 234-361.
71. Zakia Bano, **Rajarathnam,S.** and Shashirekha,M.N. (1992) Mushrooms. The unconventional single cell protein for a conventional consumption. **Indian Food Packer**, **46(6)**, 20-31.
72. Zakia Bano, **Rajarathnam,S.** and Shashirekha,M.N. (1993) Production and processing of mushrooms. **Food Digest**, **16(1)**, 61-69.
73. Zakia Bano, Shashirekha, M. N and **Rajarathnam,S.** (1996) Biotransformation efficiencies of ligno-cellulose wastes by mushroom in solid state fermentation. **Journal of Scientific and Industrial Research**, **55** : 400-407.
74. **Rajarathnam,S.** Shashirekha,M.N. and Zakia Bano (1998). Biodegradative and biosynthetic capacities of mushrooms: Present and future strategies. **Critical Reviews in Biotechnology (U.S.A)**, **18(2&3)**: 91-236.
75. **Rajarathnam, S.**, and Shashirekha, M.N., (2003). Mushrooms and Truffles: Classification and morphology. **Encyclopedia in Food Science and Nutrition**, **Academic Press**, (U.K.) pp4040-4048.
76. **Rajarathnam, S.**, and Shashirekha, M.N., (2003). Mushrooms and Truffles: Use of Wild Mushrooms. **Encyclopedia in Food Science and Nutrition**, **Academic Press**, (U.K.) pp4048-4054.

Text book on "**Advances in fruit and vegetable technologies**" (that had sought Director's kind approval), with nineteen chapters, edited,(S.Rajarathnam & R.S.Ramteke) Published by M/s. New India Publishing Agency, New Delhi(with six chapters):

77. **Rajarathnam, S.** Introduction and scope for fruit and vegetable technologies
78. **Rajarathnam S.** Influence of processing conditions on the quality of processed products.
79. **Rajarathnam S.** Further considerations in fruit and vegetable technologies
80. Shashirekha M.N & **Rajarathnam ,S.** Storage and processing of mushrooms
81. Vijayalakshmi ,M.R. & **Rajarathnam, S.** .Analytical methods in processing of fruits and vegetables .
82. Shashirekha, M.N. & **Rajarathnam, S.** Mushroom Nutraceuticals .

V. Popular Article

83. Contributed to the formation of the book "The Great Indian Mushrooms" (1992), for wide circulation, printed and published on behalf of **Ministry of Food Processing Industries**, Govt. of India, (20,000 copies for distribution).

VI. Patents

1. A process for the preparation of jam from custard apple. M.R. Vijayalakshmi ,M.N Shashirekha, S. Rajarathnam, and Revathy Baskaran.
2. A process for the preparation of fruit mix from custard apple. Revathy Baskaran, S. Rajarathnam, M.N. Shashirekha and M.R. Vijayalakshmi.
3. A process for the preparation of dehydrated product from custard apple. S. Rajarathnam, M.N. Shashirekha, M.R. Vijayalakshmi, Revathy Baskaran.
4. A process for the preparation of cereal flakes from custard apple. M.R. Vijayalakshmi S. Rajarathnam, M.N. Shashirekha, Revathy Baskaran.
5. A process for the preparation of nectar from custard apple. S. Rajarathnam, M.N. Shashirekha, M.R. Vijayalakshmi, and Revathy Baskaran.
6. A process for the preparation of jelly from custard apple. M.N. Shashirekha, S.Rajarathnam, M.R. Vijayalakshmi and Revathy Baskaran.
7. A process for preparation of shelf stable custard apple pulp. M.N. Shashirekha, S.Rajarathnam, M.R. Vijayalakshmi and Revathy Baskaran .
8. Custard apple powder and a method for preparation. Revathy Baskaran, M.R. Vijayalakshmi , M.N. Shashirekha and S. Rajarathnam.
9. A process for preparation of microfiltered RTS beverage from custard apple. Ib. Singh, M.R. Vijayalakshmi , M.N. Shashirekha and S. Rajarathnam.
10. A process for discoloration free dehydrated pear. M.N. Shashirekha, Mahadevama, P.V.Salimath and S. Rajarathnam.
11. An improved process for the storage of fresh mushrooms. M.N. Shashirekha, S. Rajarathnam, M.C. Varadaraj and K.R. Kumar.
12. An improved device for economic production of an edible fungus. S. Rajarathnam, Zakia Bano and M.N. Shashirekha.

13. A simple process for organic production of an edible fungus. S.Rajarathnam, Zakia Bano and M.N. Shashirekha.
14. A process for the preparation of instant natural fruit milk shake powders. S.Rajarathnam, M.R. Vijayalakshmi, Revathy Baskaran and M.N. Shashirekha.
15. A process for the preparation of spray dried powder from kinnow orange. Revathy Baskaran ,M.N. Shashirekha,M.R. Vijayalakshmi,K.V. R. Ramana and S. Rajarathnam.
16. A process for the preparation of jelly from kinnow orange.M.N. Shashirekha, Revathy Baskaran ,M.R. Vijayalakshmi,K.V.R. Ramana andS. Rajarathnam.
17. A process for the preparation of instant soup mix from broccoli. M.N. Shashirekha, M.R. Vijayalakshmi,Revathy Baskaran and S. Rajarathnam.
18. A process for the preparation of RTS beverage from banana pseudostem. M.R. Vijayalakshmi and S.Rajarathnam.
19. A process for the extension of storage life of fresh custard apple fruits by surface coating with cactus mucilage . M.N.Shashirekha and S. Rajarathnam.
20. A process for herbal ripening of banana. M.N.Shashirekha, M.N.Keshavaprakash, B.S.Sridhar, R.S.Matche and S.Rajarathnam.
21. Utilization of coffee wastes for production of edible biomass. Sanjukta Patra, V.R.Sarath babu, M.S.Thakur, M.N.Shashirekha and S.Rajarathnam.
22. Artificial ripening device for banana and similar fruits B.S. Sridhar, M.N. Keshava Prakash, M N. Shashirekha and S. Rajarathnam.
23. A process for preparation of beverage and jelly from mangosteen fruit rind .M.N. Shashirekha, Shylaja M. Dharmesh, and S. Rajarathnam.
24. A process for the preparation of bio-functional beverage from sweet orange (Citrus sinensis) M.N. Shashirekha, Shylaja M. Dharmesh , andS. Rajarathnam.

VII. Technology / Process / Product development:

a) List of processes:

Sl.No.	Title	Authors
1.	Large scale production of oyster mushrooms on coir pith	S. Rajarathnam, Zakia Bano M.N. Shashirekha
2.	Large scale production of oyster mushrooms-Urban model	S. Rajarathnam, Zakia Bano M.N. Shashirekha
3.	Large scale production of oyster mushrooms-Rural model	S. Rajarathnam, Zakia Bano M.N. Shashirekha
4.	Process for oyster mushroom dehydration.	S. Rajarathnam, Zakia Bano M.N. Shashirekha
5.	Oyster mushroom-Pickle & sweet chutney.	S. Rajarathnam, Zakia Bano M.N. Shashirekha
6.	Mushroom canning	S. Rajarathnam, Zakia Bano M.N. Shashirekha
7.	Large scale production of oyster mushrooms on coffee pulp	S. Rajarathnam, Zakia Bano M.N. Shashirekha.
8.	Mushroom production by using substrate supplemented with cotton seed meal	S. Rajarathnam, Zakia Bano M.N. Shashirekha
9.	Shelf stable custard apple pulp	M.N. Shashirekha S. Rajarathnam M.R. Vijayalakshmi Revathy Baskaran and Ramesh M.N.
10.	RTS beverage from micro-filtered custard apple juice	Iboyama singh, M.R. Vijayalakshmi M.N. Ramesh Revathy Baskaran M.N. Shashirekha S. Rajarathnam
11.	Instant mushroom soup mix	S. Rajarathnam Zakia Bano M.N. Shashirekha and Ramesh, M.N.
12.	Custard apple Jam, Jelly and fruit mix	M.R. Vijayalakshmi M.N. Shashirekha Revathy Baskaran M.N. Ramesh S. Rajarathnam

13.	Debittering of kinnow orange juice for preparation of concentrate and sweetened juice	S.K. Berry, Seghal, Shashirekha, M.N., Revathy Bhaskaran, K.V.R. Ramana, Rajarathnam, S.,Venkatesh Murthy, Mohan Lal, Vijayalakshmi, M.R, Asha
14.	Process for preparation of jelly and spray dried powder from kinnow orange, free of bitterness	M.N. Shashirekha,M.R. Vijayalakshmi Revathy Baskaran K.V.R. Ramana S. Rajarathnam
15.	Process for preparation of product from Pear-dehydrated	M.N. Shashirekha, M.R. Vijayalakshmi, Revathy Bhaskaran, M.R. Asha, P.C.S. Nambiar and S. Rajarathnam
16.	Process for preparation of product from Pear-Juice	M.R. Vijayalakshmi, M.N., Shashirekha, Revathy Bhaskaran, M.R. Asha, P.C.S. Nambiar and S. Rajarathnam
17.	Process for preparation of product from Pear-Powder	Revathy Bhaskaran, M.R. Vijayalakshmi, M.N. Shashirekha, M.R. Asha, P.C.S. Nambiar and S. Rajarathnam
18.	A process for herbal ripening of banana	M.N. Shashirekha,L.Jagan Mohan Rao, M.N.Keshav Prakash, B.S.Sridhar and S. Rajarathnam
19.	A process for development of cereal flakes and spray dried powder from custard apple.	M.R. Vijayalakshmi, Revathy Baskaran , M.N. Shashirekha, Umesh Hebbar and S. Rajarathnam
20.	A process for development of instant broccoli soup mix.	M.N. Shashirekha, M.R. Vijayalakshmi, Revathy Baskaran and S. Rajarathnam
21.	Process for the extension of storage life of custard apple	M.N. Shashirekha, Umesh Hebbar and S. Rajarathnam.
22.	Process know-how for the preparation of blended beverages from banana pseudostem juice	M.R. Vijayalakshmi, P.C. S. Nambiar and S. Rajarathnam
23.	A process for preparation of beverage and jelly from sweet orange (<i>Citrus sinensis</i>) fruit	M.N.Shashirekha ,Shylaja M.Dharmesh , S.Rajarathnam , Umesh Hebbar, Prem Vishwanath,Maya Prakash,Vijayalakshmi

24.	A process for preparation of nutraceutical beverage and jelly from mangosteen rind	M.N.Shashirekha ,Shylaja M.Dharmesh S.Rajarathnam , Umesh Hebbar, Maya Prakash
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b) List of products developed:

1. Instant natural fruit milk shake powders
 2. RTS custard apple beverage
 3. Stable ,frozen custard apple pulp.
 - 4 Kinnow orange jelly.
 5. Kinnow orange spray dried powder.
 6. Instant mushroom soup mix.
 7. Texturized banana (at lab scale)
 8. Texturized mango (at lab scale)
 9. Cereal flakes from kinnow orange
(directly without debittering process)
 10. Marmalade from Kinnow orange (directly without debittering)
 - 11.RTS beverage from kinnow orange
(directly without debittering process)
 12. Mushroom pickle
 13. Mushroom sweet chutney
 14. Pear juice
 15. Dehydrated broccoli
 16. Broccoli soup mix
 17. RTS banana pseudo stem beverage
 18. Mushroom biscuits
 19. Mushroom flakes
 20. RTS beverage from pear
 - 21.Button Mushroom beverage
 22. Pear dehydrated
 23. Mangosteen rind beverage
 - 24.Mangosteen rind jelly
 - 25.Sweet orange de-bittered bio-functional beverage
 - 26.Sweet orange de-bittered jelly
 - 27.Bio-functional mushroom jelly
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